Remarks

In view of the foregoing amendments and these accompanying remarks, it is respectfully requested that this application be reconsidered.

Claim 28 has been amended in order to correct an obvious typographical error. Based on the Specification and the July 25, 2005 Amendment And RCE, Applicant was clearly identifying that the invention has a "means for applying pressure on said electrodes so as to counteract the electrode's volume changes resulting from electrochemical reaction between the electrolyte and the active material." In the claim, however, there was an obvious typographical error and the word "changes" was written as "charges." This has now been corrected. In so doing it is believed that the rejection under 35 USC 112 has been obviated and it is requested that that the rejection be withdrawn.

Further, consistent with the disclosure herein and the heretofore and the accompanying arguments, Claim 28 has been additionally amended to more distinctly claim and particularly point out the invention. These changes are believed to even more distinctly highlight the invention and to define the point of novelty. None of these changes constitute new matter.

Applicant has considered the prior art rejections and respectfully disagrees with the Examiner.

In order to better emphasis the point of novelty herein, Applicant wishes to again summarize the nature of the herein Invention. This invention refers to a secondary type (i.e. rechargeable) battery of a Silver-Zinc system, which utilizes flexible electrodes made out of formed-compacted (neither glued, nor sintered) particles. Each of the electrodes is wrapped up in a single flexible separator, which insulates one electrode from another without leaving any clearance between them. The active materials of the electrodes are zinc oxide and silver (when the battery discharges). The particles of the active material are carried by the substrates, which could be made out of a metallic grid or made out of a woven conductive fabric. The electrodes are installed in a casing filled with an electrolyte, the ions of which can diffuse through the pores of the separators to approach the particles

of the active material and thus enable the electrochemical reaction to take place during charging and discharging of the cell. The electrodes can be in a flat or spiral (wound up) configuration. One of the salient features of the invention is using an elastic mechanical means, which is capable of exerting pressure on the electrodes in order to ensure close contact between the particles of the active material themselves and at the same time close contact between the particles and the substrate. In one embodiment of the invention this elastic means is a spring put over the electrodes as shown in Fig.1. In the other embodiment this means is the casing itself, and the walls of the casing, due to their elasticity, apply pressure to the separators enveloping the electrodes, if they are densely packed within the casing, as shown in Fig.3.

During periodical charging and discharging of the cell, as described in the present Invention, the active material undergoes chemical changes. Since these changes are accompanied by a change of density (bulk and absolute), the electrodes can periodically change their volume. Due to the volume changes, there is a danger that the structural integrity of the electrodes will deteriorate and accordingly the electronic conductivity will be reduced, as well as the cell's efficiency. The present Invention compensates for these volume changes and prevents structural deterioration by using the mechanical elastic means, which applies pressure to the electrodes. The elastic means accommodates with the periodical volume changes and ensures that, during charging and discharging, in each electrode there is always maintained intergranular contact between particles of the active material and the respective substrate.

In one of the embodiments, the separator is made of cellophane, which swallows in the electrolyte and exerts additional pressure on the particles of the active material.

Pauling (US Patent 6,207,316 and WO 98/38686) is believed to be entirely distinct and it does not teach or even suggest "applying pressure on said electrodes so as to counteract the electrode's volume changes resulting from electrochemical reaction between the electrolyte and the active material." This is a key aspect of Applicant's invention and Pauling makes no mention of it at all.

Pauling employs two electrodes. While only one of them is provided with a rigid separator arrangement, the other electrode is not provided with any separator arrangement. As shown in Figure 1 of Pauling, it is only the left-hand electrode 2a that has a separator arrangement 7 and the right-hand electrode 2b has no separator at all. In the present Invention, each of the electrodes is provided with a dedicated separator.

Pauling employs rigid electrodes, which are formed by rigid, inelastic, metallic supports 8a, 8b with electrochemically active coatings 6a, 6b applied on the supports. The present Invention employs flexible electrodes, which are formed by compressed discrete particles of electrochemically active material deployed on a flexible substrate.

Pauling employs "an inner, first, small-pored separator 7a," which is located adjacent to the electrode 8a, which "serves to reduce certain concentration gradients in the electrolyte 4 in the vicinity of the electrochemically active coating." By virtue of the concentration changes it is possible to reduce structural and/or shape changes, which take place during recharging and which are linked merely with the gradient-driven electro osmosis (Column 2, lines 43-45; Column 5, lines10-21; Column 8, lines 24-32). In other words, the first separator functions as a membrane, which varies the concentration of the electrolyte in the vicinity of one electrode. By virtue of this provision the possible structural and/or shape changes are prevented on account of a chemical mechanism. This mechanism is provided for only one of the electrodes. It should be kept in mind that the membrane is not capable of and is not designed for applying mechanical pressure on the electrode.

In the present Invention, elastic mechanical means are being employed, which exert pressure simultaneously on each of the electrodes. These elastic means are capable of accommodating periodic volume changes of the electrodes associated with charging and discharging of the cell. Furthermore, the first separator of Pauling is not capable of exerting mechanical pressure since it does not swallow. In Pauling, the recommended material for the first separator is polyethylene (Column 6, lines 27-39), while in the present Invention the preferred material is cellophane. In Applicant's previous response, it was explained that polyethylene does not swallow.

Therefore, the first separator cannot be regarded as a means for applying pressure. Pauling does not suggest or disclose using pressure other than for preventing loose particles from falling down.

The second separator 7b employed in Pauling is rigid and "is used for mechanically stabilizing the complete electrode 7a" (Column 8, lines 34 – 44). It is made of organic material (Teflon) or ceramic or glasses-not capable of swelling, and, thus, it cannot cause any increase of pressure. In the present Invention, the separators are flexible.

The purpose of the second separator in Pauling is to prevent the sinking of mechanically unstable discharge products. These products might appear due to fracturing and scaling of the electrochemically active coating when the cell charges and discharges. The fragments of the coating detach from the support and fall down. The second separator surrounds the first separator and prevents these gravity-driven structural and/or shape changes. Therefore, the shape changes, which are taken care of by the second separator, are not of the same nature as the changes taking place in the flexible electrodes of the present Invention. Pauling employs the second separator, "...because this leads to a particularly easy handling of the enclosed electrode configuration and with respect to the electrode/separator interface little space is left for a shape and/or volume change to the electrode surface" (Column 5, line 30-35). In other words, the second separator is merely a case, which closely surrounds the first separator and provides a mechanical barrier for maintaining integrity of the electrochemically active coating. The case is not elastic and it does not apply direct pressure on the electrode.

In the present Invention, there is a flexible electrode and not a rigid electrode. Functioning of the electrodes of the present Invention is not associated with fragments, which might fall down, and therefore the present Invention does not need a second separator, which would function as a rigid case for preventing these fragments from sinking.

Therefore, Applicant believes that Pauling is not provided with a comparable means for applying pressure in the sense intended in the present Invention. Pauling employs merely a rigid barrier, which prevents an electrode's fragments from falling down. This is the meaning of the

shape and/or volume changes in Pauling. Pauling does not teach applying pressure for preventing the shape changes.

In the present Invention, there is an elastic mechanical means, which exerts direct pressure simultaneously on both flexible electrodes. This means accommodates periodical electrode volume changes associated with electrochemical reaction between the electrolyte and the active material (during charging and discharging of the cell). Despite these periodical volume changes, close contact is maintained between particles of the active material and between the particles and the substrate. This is the meaning of the volume changes of the present invention.

Therefore, since Pauling does not disclose or suggest the claimed invention, it does not anticipate the herein invention and it is, therefore, respectfully requested that the rejection under 35 U.S.C. 102 be withdrawn.

Devitt (US Patent 3,669,746) cannot be combined with Pauling. Neither Pauling nor Devitt contains a explicit or implicit teaching, suggestion or incentive supporting the alleged combination.

Furthermore, such a combination would not be feasible and would destroy the intended function of Pauling, since Pauling employs two flat, rigid, spaced apart electrodes and only one of them is provided with separator arrangement, which includes a rigid second separator. Devitt employs two spirally wound, flexible electrodes, which are adjacent to each other and are provided with dedicated flexible separators. In order to u the flexible electrodes of Devitt in the cell of Pauling, it would be required to unwind the electrodes and plac one of the electrodes remote from the other.

Moreover, since Pauling employs a rigid separator it would be required to provide it with very thick walls, otherwise it would not be capable of counteracting the periodical volume changes of the flexible electrodes of Devitte. This measure, in its turn, would be associated with an increase of specific volume of th cell and reducing its efficiency.

Thus, the alleged combination of Pauling with Devitt does not obviate or suggest the subject matter of the instant Invention and does not preclude the patentability of claim 28. Accordingly, the rejection under 35 U.S.C. 103 should be withdrawn.

Dews (US Patent 3,912,538) also cannot be combined with Pauling. Neither Pauling nor Dews contains any explicit or implicit teaching, suggestion or incentive supporting the alleged combination.

Furthermore, such a combination would not be feasible, since Dews employs electrodes made from graphite particles, which are embedded in a substrate made from carbon fiber. Pauling employs rigid electrodes made of metallic support coated by an electrochemically active coating. To implement the flexible electrode used in the primary cell of Dews instead of the rigid electrode used in the secondary cell of Pauling, it would be necessary to provide the cell of Pauling with means for applying pressure on the electrode to ensure electronic contact between the graphite particles. Without such a means the cell of Pauling provided with the electrode of Dews will be exhausted very quickly.

Thus, the alleged combination of Pauling with Dews does not obviate or suggest the subject matter of the instant Invention and does not preclude the patentability of claim 28. Accordingly, the rejection under 35 U.S.C. 103 should be withdrawn.

Ruetschi (US Patent 4,192,914) cannot be combined with Pauling. Neither Pauling nor Ruetschi contains any explicit or implicit teaching, suggestion or incentive supporting the alleged combination.

Such a combination would destroy the intended function of Pauling, since Pauling discloses a battery of a secondary type, i.e. rechargeable, while Ruetschi discloses a battery of primary type, i.e. dischargeable. They are entirely different classes of batteries and thus their structures cannot be combined without destroying the essence of at least one of them.

Thus, the alleged combination of Pauling with Ruetschi does not obviate or suggest the subject matter of the instant Invention and does not preclude the patentability of claim 28. Accordingly, the rejection under 35 U.S.C. 103 should be withdrawn.

Ferrando (US Patent 5,045,349) cannot be combined with Pauling. Neither Pauling, nor Ferrando 1 contains any explicit or implicit teaching, suggestion or incentive supporting the alleged combination.

Furthermore, such a combination would not be feasible, since Pauling discloses a battery provided with rigid electrodes, which are made of a continuous, electrochemically active coating, which is applied on rigid metallic support. Ferrando discloses a method for manufacturing silver-nickel cathodes, which are made of discrete nickel particles, adhered to a graphite fiber plaque. Both the particles and the plaque are coated by silver metal. Without providing the cell of Pauling with a dedicated means for maintaining contact between discrete particles, the cathode of Ferrando in the cell of Pauling would not be operable.

Thus, the alleged combination of Pauling with Ferrando does not obviate or suggest the subject matter of the instant Invention and does not preclude the patentability of claim 28. Accordingly, the rejection under 35 U.S.C. 103 should be withdrawn.

Ferrando 2 (US 5283138) likewise cannot be combined with Pauling. Neither Pauling, nor Ferrando contains any explicit or implicit teaching, suggestion or incentive supporting the alleged combination.

Such a combination would not be feasible, since Pauling discloses a battery provided with rigid electrodes, which are made of a continuous, electrochemically active coating, which is applied to rigid metallic support. Ferrando discloses a lightweight zinc electrode, which is made of a flexible support grid hosting therein zinc active composite material. The grid is made of a sintered mat or copper metal coated graphite fibers and the active material is pressed or injection molded into the fiber mat so that the composite material is attached to and surrounds the fibers. In other words, the electrode of Ferrando consists of discrete particles attached to a substrate. Without providing the cell of Pauling with a dedicated means for maintaining contact between the particles of active composed material and the fiber, the cathode of Ferrando in the cell of Pauling would not be operable.

Thus, the alleged combination of Pauling with Ferrando does not obviate or suggest the subject matter of the instant Invention and does not preclude the patentability of claim 28. Accordingly, the rejection under 35 U.S.C. 103 should be withdrawn.

For the above and additional reasons Ferrando '349 cannot be combined with Pauling and with Mansfield (US Patent 5,306,580). Neither Pauling, nor Ferrando, nor Mansfield contains any explicit or implicit teaching, suggestion or incentive supporting the alleged combination.

Furthermore, such a combination would not be feasible, since Pauling and Ferrando employ electrochemically active material, which is adhered to a substrate, while Mansfield employs loose active material. Such a combination would destroy the intended function of Pauling or Ferrando, since Pauling and Ferrando disclose a secondary type battery, i.e. rechargeable, while Mansfield discloses a battery of primary type, i.e. dischargeable.

Thus, the alleged combination of Pauling, Ferrando and Mansfield does not obviate or suggest the subject matter of the instant Invention and does not preclude the patentability of claim 28. Accordingly, the rejection under 35 U.S.C. 103 should be withdrawn.

Since the principal Claim 28 is not anticipated by or obvious from the prior art, then the claims dependent from this claim are likewise allowable.

Therefore, all the pending claims are novel over the cited prior art and not anticipated or obviated, and the rejections under 35 USC 103 should be withdrawn.

It is, therefore, requested that a Notice of Allowance issue and that all of the pending claims be allowed.

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Respectfully submitted,
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